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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>6</sup> : <b>A21D 6/00, 13/02</b>	<b>A1</b>	(11) International Publication Number: <b>WO 95/05743</b> (43) International Publication Date: <b>2 March 1995 (02.03.95)</b>
(21) International Application Number: <b>PCT/US94/08768</b> (22) International Filing Date: <b>2 August 1994 (02.08.94)</b> (30) Priority Data: 08/111,998                      25 August 1993 (25.08.93)                      US (71) Applicant: <b>THE PILLSBURY COMPANY [US/US]; 200 South Sixth Street, Minneapolis, MN 55402 (US).</b> (72) Inventors: <b>RABE, Gerald, O.; 5724 Lake Rose Drive, Minnetonka, MN 55345 (US). MEYERS, Thomas, A.; Route 1, Box 2, Parker Prairie, MN 56361 (US).</b> (74) Agent: <b>BRUESS, Steven, C.; Merchant, Gould, Smith, Edell, Welter &amp; Schmidt, 3100 Norwest Center, 90 South Seventh Street, Minneapolis, MN 55402 (US).</b>		(81) Designated States: <b>CA, JP, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</b>  <b>Published</b> <i>With international search report.</i>
(54) Title: <b>HIGH RATIO BAKING COMPOSITION</b>  (57) Abstract  A high ratio baking composition comprising: (a) a chlorine free heat treated soft flour; (b) an effective volume controlling amount of a non-flour fiber; (c) an effective fragility controlling amount of a protein; and (d) sugar wherein the density of a baked product resulting from the high ratio baking composition is less than about 5.6 to 6.3 g/in <sup>3</sup> and the weight ratio of the sugar to the heat treated soft flour is at least about 1:1.		

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## HIGH RATIO BAKING COMPOSITION

### FIELD OF THE INVENTION

The invention generally relates to a high ratio baking composition. More specifically, the invention is directed to high ratio bakery mixes including a heat treated soft flour, a non-flour fiber and a water soluble heat denaturable protein useful for preparation of baked goods including cakes, muffins, and pancakes among other products.

### BACKGROUND OF THE INVENTION

Treating flour with gaseous chlorine is well known in the baking industry. Flour treatment by chlorine has been found to be necessary for the production of baked products with the appropriate volume, tenderness and handling properties such as, for example, high quality cakes when using a high-ratio cake formulation. A high ratio cake formulation is one in which the weight ratio of sugar to flour in the cake is between 1:1 and 1:1.4. The difference in concentration of flour in the high ratio cakes as compared to sugar, places a greater strain on the flour during the creation of a cake structure.

If a high ratio cake is made from untreated flour, it appears to function quite normally in the earlier stages of batter development. Bell et al., J. Food Technol., 10, 147-156 (1975). The bubbles in the aerated batter expand, and the internal batter temperature rises at a similar rate to batter made from chlorine-treated flour. Grider et al., Food Microstructure, 2, 153-160 (1983). Later in the baking process, differences in the performance of batters made from untreated and chlorine-treated flours begin to appear. Batters formulated from untreated flour rise to a greater height than batters formulated from chlorine-treated flour. However, late in the bake the baked product formulated with the untreated batters falls more rapidly, and continues to fall as the baked good cools.

Russo et al., J. Food Technol., 5, 363-374 (1970);  
Frazier et al., Chemy Ind., 1008-1010 (1974); Cauvain,  
J. Sci. Food Agric., 26, 1861-1868 (1975).

Examination of the cake crumb structures has  
5 revealed considerable differences in the sizes and  
appearances of the walls of the air cells in the crumb.  
Batters containing chlorine treated flours generally  
result in cakes having discrete, well-formed air cells  
with smooth cell walls, formed by starch granules  
10 embedded in a continuous protein matrix. Grider et al.,  
Food Microstructure, 2, 153-160 (1983). In contrast,  
cakes made with untreated flours have irregular,  
deformed air cells with ragged cell walls, in which the  
protein matrix appears to be partly disrupted. It is  
15 believed that the smaller air cells are formed from the  
collapse of larger cells resulting in a new network of  
broken cells smaller in size than the original larger  
cells. Thus, it appears that the cell walls of a cake  
made from untreated flours are inherently weak and begin  
20 to deform and collapse under the weight of the cake when  
the gas pressure dissipates from within the cell  
structure.

Additionally, there is evidence that some gas  
cells remain intact at the end of the bake, and are  
25 subsequently crushed by the external pressure when the  
water vapor within them condenses. This phenomenon  
would account for the accelerated collapse of the cake  
structure observed immediately after leaving the oven.

Thus, high ratio cake mixes have employed  
30 chlorine-treated flour in their formulation. Although  
chlorine-treated flour has been used in Great Britain  
and the United States for many years, this use is not  
permitted in most of the Continental European countries.  
At the present time chlorine is permitted for use in  
35 cake flour, but its continued use as a flour additive is  
in question because of safety concerns with the  
occupational use of chlorine and the safety of consuming  
chlorinated organic compounds in general. Hodge, Baking

Industries Journal, July, page 14 (1975). There have been many attempts to formulate an acceptable alternative to chlorinated flour high ratio cakes.

Gough et al., CRC Critical Rev. in Food  
5 Science and Nutrition, September, pp. 91-113 (1978),  
disclose a review of the known alternatives to the  
chlorination of flour including heat treating the flour.  
See Russo et al., British Patent No. 1,110,771 and  
Cauvain et al., J. Sci. Food Agric., 26, 1861-1868  
10 (1975).

In Gough et al., a flour was heat treated at  
200°C (392°F) for 6 minutes. Egg albumen was then added  
to increase the cake volume of the high ratio cake, but  
the organoleptic properties of the cake were undesirably  
15 changed. Thus, only a partial solution was provided.

These known alternatives to using chlorinated  
flour in a high ratio cake mix fail to perform as well  
as chlorinated flour high ratio cake mixes in terms of  
volume, density, fragility, and texture of the resulting  
20 cake. As a result, all high-ratio baking compositions  
produced commercially are made of and depend upon  
chlorinated flour. Thus, a substantial need exists for  
a high ratio baking composition in which the flour does  
not require treatment by chlorination.

25

#### SUMMARY OF THE INVENTION

The invention is directed to a high ratio  
baking composition without chlorinated flour equal in  
all respects to that made with chlorinated flour. In  
30 one aspect of the invention, there is provided a high  
ratio baking composition comprising a heat treated soft  
flour, sugar, an effective volume controlling amount of  
a non-flour fiber and an effective fragility controlling  
amount of a protein source.

35 In a preferred aspect, this invention relates  
to a high ratio cake composition comprising a heat  
treated soft wheat flour, sugar; about 0.25 to 3% by  
weight of a non-flour fiber and about 0.25 to 6% by

weight of a water soluble, heat denaturable protein wherein the heat treated soft wheat flour is prepared by the step comprising heating a soft wheat flour at a temperature greater than about 180°F for a sufficient amount of time to reduce the moisture content of the soft wheat flour to below about 10% by weight.

While not intending to limit the scope of the invention, it is believed that the moisture loss during the heat treating process indicates the amount of treatment the flour has undergone. It is unknown whether the moisture loss by itself is responsible for changes to the flour.

In a further aspect of the invention, there is provided a method of producing a high ratio baking composition comprising the steps of preparing a heat treated soft flour and combining the heat treated soft flour, with a non-flour fiber, a water soluble, heat denaturable protein, and a sugar.

In an additional aspect of the invention, there is provided a high ratio baked product prepared from the high ratio baking composition prepared from the method of the invention.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The invention generally comprises high ratio baking compositions useful for the production of baked goods such as cakes with good volume and handling properties. The high ratio baking composition generally comprises heat treated soft flour, non-flour fiber and a protein source. The high ratio baking composition of the invention has structural, organoleptic and handling characteristics comparable to those high ratio baking compositions utilizing chlorinated flour.

#### THE COMPOSITION

##### A. Heat Treated Flour

A principal constituent of the high ratio baking composition is heat treated flour. Flour generally occurs as either soft or hard flour. Soft

flour is generally used in high ratio baking compositions. Soft flours are those which function to provide a more moist, more tender product with better organoleptic properties. Concomitantly, the function of the soft flour in a baked good is to provide structural rigidity.

Generally, any soft flour may be used in the invention. Sources of soft flour currently include, but should not be limited to, types of wheat. Importantly, the soft flour of the invention has not, and will not, be treated with chlorine. Preferably, the composition of the invention will comprise a soft wheat flour.

Heat treatment of the soft flour functions to enhance the ability of the soft flour to provide a baked product with improved volume and structural strength. Generally, the heat treatment is performed on the soft flour at a sufficient temperature for a sufficient amount of time to effectively reduce the moisture level in the soft flour to about 5 to 10% by weight. Preferably the moisture level in the soft flour is reduced to about 5 to 9% by weight, more preferably 5 to 7% by weight.

In general, the soft flour is not heated for too long or at too high of a temperature or for too long a time such that the soft flour would begin to scorch, caramelize, turn grey or otherwise decompose. The useful temperature and time ranges vary considerably. However, as a general rule, the higher the treatment temperature the less treatment time required. For example, the soft flour could be treated about 300°F to 600°F for about 0.1 to 45 seconds, or treated at about 100°F to 200°F for about 1 to 24 hours.

These general guidelines should serve to illustrate but not to limit the invention. It can be appreciated from these guidelines that heat treating the soft flour too much will damage the soft flour, and heating the soft flour too little will not improve the function of the soft flour to the appropriate level.

In one embodiment of the invention, the soft flour is heat treated by heating the soft flour to a temperature greater than about 180°F for a sufficient amount of time to reduce the moisture content in the soft flour to below about 10%.

Preferably, the heating of the soft flour is performed at a temperature greater than about 220°F. More preferably, the heating is performed at a temperature of about 240 to 250°F.

The heating may be performed at about 240 to 250°F for about 15 to 60 minutes. Preferably the heating is performed for about 30 to 60 minutes. More preferably the heating is performed for about 50 to 60 minutes.

Significantly, the heating is performed until the moisture content of the soft flour is reduced to about 5 to 10% by weight of the soft flour. During the heat treatment of the soft flour, the soft flour is modified in such a manner that a baked product from this treated flour has improved volume compared to the non-heat treated soft flour. Preferably, the heating is performed until the moisture content of the soft flour is reduced to about 5 to 8% by weight of the soft flour which produces a hygroscopic heat treated soft flour with modified baking properties. More preferably, the heating is performed until the moisture content of the soft flour is reduced to about 5 to 7% by weight of the soft flour.

After the heating is completed, the soft flour may be tempered to replace the moisture in the soft flour. Tempering is a process where the soft flour is spread out in a thin layer in a cabinet with humidity control and the flour absorbs moisture from the humidified air until the flour reaches the equilibrium moisture level.

Preferably, the soft flour is tempered until the moisture level in the soft flour is increased to about 10.5% and more preferably about 11 to 12% by



weight of the soft flour. Tempering the soft flour after completion of the heating of the soft flour functions to return the soft flour to about its original moisture level before the heating was performed.

5 In preparation of the baked good, the addition of too much of the heat treated soft flour generally results in a dry baked good which crumbles easily and has diminished mouthfeel. In contrast, the use of too little heat treated soft flour reduces the structural  
10 integrity and volume of a baked good prepared from the high ratio baking composition of the present invention.

Generally, the high ratio baking composition of the present invention comprises about 20 to 45% by weight of the heat treated soft flour. Preferably the  
15 high ratio baking composition comprises about 25 to 41% by weight of the heat treated soft flour. More preferably, the high ratio baking composition comprises about 28 to 37% by weight of the soft wheat flour.

#### B. Fiber

20 The composition of the invention generally also comprises a non-flour fiber. Fiber includes all food components that are not absorbed during digestion. Within the context of the invention, non-flour fiber means that this fiber component is from a fiber source  
25 separate from and in addition to the fiber inherent in the heat treated soft flour. The addition of a non-flour fiber to the high ratio baking composition of the present invention is essential for obtaining baked volume, improved organoleptic properties and uniform  
30 cell structure. Generally, fiber resulting from any number of materials may be used including non-flour fiber materials resulting from oats, rice, beans, peas, soybeans, nuts, barley, psyllium, gums, cotton seed, cellulose, sugar beet, fruit, figs, bran flakes, wheat,  
35 broccoli, cabbage, green beans, brussels sprouts, radishes, cucumbers, green peppers, prunes, sweet potatoes, corn, cauliflower, apples, lentils, nuts, oranges and bananas, for example. In a preferred

embodiment of the invention, the non-flour fiber comprises an oat fiber.

In a typical embodiment of the invention, there is an effective volume controlling amount of a non-flour fiber. Preferably the high ratio baking composition of the present invention comprises about 0.25 to 3% by weight of the non-flour fiber. More preferably, the high ratio baking composition comprises about 0.25 to 1.5% by weight of the non-flour fiber. Most preferably, the high ratio baking composition comprises about 0.75 to 1.25% by weight of the non-flour fiber. Importantly, the addition of too much non-flour fiber into the high ratio baking composition, results in a baked product which is dry and has poor mouthfeel.

15 C. Protein

In addition to heat treated soft flour and non-flour fiber, the high ratio baking composition of the invention may also comprise a protein source. Within the context of the invention, non-flour protein means that this protein component is from a protein source separate from and in addition to the protein inherent in the heat treated soft flour. Sources of protein include, but are not limited to, vegetables, nuts, cereals, grains, legume, milk, as well as albumin sources such as eggs, meat, fish, blood, collagen, gelatin and casein. Proteins function to reduce the fragility and enhance the handling properties of a baked good prepared from the high ratio baking composition of the invention.

30 Preferably, the protein is water soluble, and is heat denaturable during the baking process. Water soluble proteins are preferred in the high ratio baking compositions of the invention. The continuous liquid phase in a batter formed from the high ratio compositions is water, and therefore, the proteins will be soluble and will become uniformly mixed or dissolved throughout the composition.

If a water soluble non-flour protein is not utilized, the protein may not be soluble in the high ratio baking compositions of the invention. This may result in less uniformity of the compositions.

5 Heat denaturable proteins polymerize and associate with other constituents during the baking process and are believed to form a gel network in the high ratio baked product. The network functions to provide adhesion or otherwise act as a glue to hold the  
10 baked product together. This improves the handling properties.

Generally, any heat denaturable protein is useful in the composition of the invention. Preferably, the water soluble, heat denaturable protein is selected  
15 from the group consisting of low temperature processed egg albumen, low temperature processed whey protein and mixtures thereof.

Generally, the protein may be present in the high ratio baking composition of the invention in the  
20 form of a water soluble, heat denaturable protein in a concentration ranging from about 0.25 to 6 wt-% by weight of the solids in a batter prepared from the high-ratio baking composition, preferably from about 0.75 to 3 wt-% by weight of the solids in the batter, and most  
25 preferably from about 0.75 to 1.5 wt-% by weight of the solids in the batter.

The addition of too much protein may result in a dry, tough baked good. In contrast, the addition of too little protein may result in a baked product which  
30 is fragile and has poor handling properties.

#### D. Sugar

The high ratio baking composition may additionally comprise sugar. The sugar acts as a sweetener and bulking agent providing improved taste and  
35 higher moisture mouthfeel in the baking composition. The sugar in the baking composition dissolves quickly upon consumption which provides a moist and tender mouthfeel. A high ratio baking composition is a

composition where the weight ratio of the sugar to heat treated soft flour is at least about 1 part sugar to 1 part heat treated soft flour and can be as high as 1.4 parts sugar to 1 part flour. Generally, the high ratio baking composition of the invention comprises sugar and heat treated soft flour wherein the ratio of sugar to heat treated soft flour is at least about 1 to 1. Preferably the ratio of sugar to heat treated soft flour is at least about 1.15 to 1. More preferably the ratio of sugar to heat treated soft flour is at least about 1.3 to 1.

The addition of too much sugar results in an insufficient amount of flour being present in the baking composition. Thus, a baked good prepared from a composition with too much sugar will collapse.

In contrast, too little sugar in the baking composition affords a baked good with poor taste and mouthfeel. The baked good has poor organoleptic properties because there is not enough sweetener in the baking composition. The baked product has a dry mouthfeel because there is an insufficient amount of sugar in the composition to have the tender or moist mouthfeel.

Illustrative examples of the above ratios converted to weight percentages are shown below. The table shows what the upper and lower amounts of sugar that can be present in the high ratio baking composition for each with respect to flour concentration.

Table 1

	<u>Wt-%</u> <u>Soft Flour</u>	<u>Suggested Lower</u> <u>Limit of Sugar Wt-%</u>	<u>Suggested Upper</u> <u>Limit of Sugar Wt-%</u>
30	20	20	28
35	30	30	42
	45	45	63

#### E. Additional Properties

The high ratio baking composition of the invention can optionally comprise a variety of materials to modify any number of organoleptic, nutritional,

flavor, color or other properties of a baked good resulting from the high ratio baking composition. In particular, the compositions can additionally include salt, bicarbonates, phosphates, gums, flavorings, starches, colorings, shortening, lecithin, food acids, oils, fats, milk, butter, and water.

F. Method of Preparation

A baked product prepared from the high ratio baking composition can be prepared by several known procedures. In one method, the oven is heated to 350°F. Then two round pans measuring 8 inches in diameter are greased generously with shortening, margarine or butter and then lightly floured or sprayed with no-stick cooking spray. In a separate step, a dry high ratio cake mix of the present invention, is mixed with water, oil and eggs in a large bowl at low speed until moistened. The baking composition is then beat for two minutes at high speed, and poured into the greased and floured pans. The pans containing the batter are then placed in the preheated oven for 25 to 35 minutes. The high ratio cake is done when a toothpick inserted in the center comes out clean or the high ratio cake springs back when lightly touched in the center. The high ratio cake is then removed from the oven and allowed to cool in the pan on a cooling rack for 15 minutes. The high ratio cake can then be removed from the pan.

G. Formulations

The weight percentages throughout the invention including the formulations below are calculated on a dry weight basis and do not include any water in the formulation. The weight percentages of the heat treated flour, non-flour fiber and sugar are calculated from the weight of the solids in the high-ratio baking composition. The weight percent of the non-flour protein is calculated from the weight of the solids in a batter made from the high-ratio baking compositions.

Table 2 (wt-%)

	<u>Useful</u>	<u>Working</u>	<u>Preferred</u>
5 Heat Treated Flour	20 to 45	25 to 35	25 to 34
Fiber	0.25 to 3	0.25 to 1.5	0.75 to 1.25
Protein	0.25 to 6	0.75 to 3	0.75 to 1.5
Sugar	25 to 55	30 to 42	34 to 40

10

Density

The density of the high ratio baked products prepared from the high ratio baking compositions of the invention are comparable to baked products prepared with chlorinated flour. Preferably, the density of the high ratio baked product is less than about 5.6 to 6.3 g/in<sup>3</sup>. More preferably, the density of the high ratio baked product is about 5.2 to 5.9 g/in<sup>3</sup>, most preferably 4.8 to 5.5 g/in<sup>3</sup>.

20

WORKING EXAMPLES

The following working examples are provided to further illustrate the invention. However, these examples are not intended to be construed as limiting of the invention.

25

In the examples below, high ratio baking compositions were prepared using the specified components in each example below. Cakes were then baked utilizing the high ratio baking compositions of the examples. The "control" formulas in the examples below utilized chlorinated flour whereas the experimental formulas of the invention used only heat treated soft flour. Various characteristics of the baked products were then compared including: volume, moisture, fragility, mouthfeel and contour.

35

Volume Index

This procedure determines the volume indexes on baked cakes and muffins. The procedure is applicable to round, square, rectangular and loaf shaped cakes of different dimensions by proper setting and adjustment of the universal symmetry apparatus used.

A Universal Cake Symmetry Machine, manufactured by The Pillsbury Company Machine Shop, 300-2nd St., S.E., Minneapolis, Minnesota 55414 is utilized during the testing procedure.

5 Procedure

1. Place the empty pan in instrument.  
Calibrate equipment so that each of the three scales read "0" when the scale feet rest on the bottom of the pan. Be certain that the scale feet and the base of  
10 instrument are clean, and that the pans have flat bottoms (not bowed, bent, etc.)
2. The accuracy of the scale reading may then be checked by means of test blocks (or accurate ruler). The scale units are in sixteenths of an inch.
- 15 3. From the settings indicated on the table attached, select the proper machine type, and set back slide and both cams of the machine to the proper index markings.
4. Insert the proper jig into the base pan  
20 cut out or use the stop where it is indicated in the table. If the machine model in use does not have a stop, prepare a jig to center the pan.
5. As indicated in the table, insert the proper scale carriage stop adjusters into the scale  
25 carriage grooves on both sides.
6. Cook the baked product to be tested as directed.
7. Place the product (in the pan) beneath the scale carriage and against the appropriate jig or  
30 stop.
8. Lower the scale carriage until the three scales nest on the product and the scale carriage nests on the stops (or on adjusters when used).
9. Read the value on all three scales.  
35 Where the adjusters are used, add 20 to each scale value.
10. Calculate the volume index.  
Volume Index = Sum of Scale Values on all 3 Scales

Example 1Yellow Cake Formula

This example shows the volume effect that the heat treatment temperature has on the high ratio cakes which are treated for sixty minutes.

EXAMPLES

	1A	1B	1C
	200°F	225°F	245°F
10 <u>Treatment Temp.</u>	<u>(grams)</u>	<u>(grams)</u>	<u>(grams)</u>
<u>Mix</u>			
Sugar	233	233	233
15 Flour	193	193	193
Shortening	55	55	55
Additional	48	48	48
Ingredients			
20 <u>Add</u>			
Egg (whole)	156	156	156
Oil	67	67	67
Water	224	224	224
25 <u>Resulting Product</u>			
Volume	79	83	88
Fragility	fragile	fragile	fragile
Contour	flat	flat	slight contour



Example 2Yellow Cake Formula

- 5 This example shows the volume effect that the heat treatment time has on the high ratio cakes which are heat treated at about 245°F.

EXAMPLES

10		2A	2B	2C
	<u>Treatment Times</u>	<u>10 min.</u>	<u>30 min.</u>	<u>60 min.</u>
	<u>Mix</u>			
15	Sugar	233 grams	233 grams	233 grams
	Flour	193 grams	193 grams	193 grams
	Shortening	55 grams	55 grams	55 grams
	Additional	48 grams	48 grams	48 grams
	Ingredients			
20	<u>Add</u>			
	Egg (whole)	156 grams	156 grams	156 grams
	Oil	67 grams	67 grams	67 grams
	Water	224 grams	224 grams	224 grams
25	<u>Resulting Product</u>			
	Volume	83	84	88
	Fragility	fragile	fragile	fragile
	Contour	sunken	flat	slight
30				contour

Example 3Yellow Cake Formula

- 5 This example shows the volume effect that varying oat fiber concentration has on the high ratio cakes below. The soft flour was heated at 245°F for 60 minutes.

EXAMPLES

10		3A	3B	3C
	<u>Oat Fiber</u>	<u>0%</u>	<u>1%</u>	<u>3%</u>
	<u>Concentration</u>	<u>(grams)</u>	<u>(grams)</u>	<u>(grams)</u>
15	<u>Mix</u>			
	Sugar	233	231	226
	Flour	193	191	187
	Shortening	55	54	53
	Additional	48	48	47
20	Ingredients			
	Oat Fiber	-	5.3	15.9
	<u>Add</u>			
	Egg (whole)	156	156	156
25	Oil	67	67	67
	Water	224	224	224
	<u>Resulting Product</u>			
	Volume	90	95	99
30	Fragility	Extremely fragile	Extremely fragile	Extremely fragile
	Moistness	Moist eating quality	Moist eating quality	Slightly less moist eating quality

Example 4

This example shows the volume effect that varying the protein concentration has on the high ratio cakes. The flour was a heat treated flour for about sixty minutes at about 245°F.

EXAMPLES

10	<u>Protein Concentration</u>	<u>0% (grams)</u>	<u>1% (grams)</u>
	<u>Mix</u>		
	Sugar	231	228
	Flour	191	189
15	Shortening	54	54
	Additional Ingredients	48	48
	Oat Fiber	5.3	5.3
	Egg Albumin (dried)	-	5.3
20	<u>Add</u>		
	Egg (whole)	156	156
	Oil	67	67
	Water	224	224
25	<u>Resulting Product</u>		
	Volume	95	92
	Fragility	Extremely fragile	Excellent (equal to cakes made with chlorinated flour)

Working Example 5Yellow Cake Formula

5 This example shows that a cake product of the invention  
 can be prepared with similar properties to a cake  
 product prepared from a chlorinated flour. A cake  
 product formulated with unchlorinated flour (Example)  
 was prepared and compared to a cake product formulated  
 10 and prepared with a chlorinated flour product (control).  
 The soft flour in the example was heated at 245°F for  
 60 minutes using a twin screw jacketed mixer, pressure  
 rated to 50 p.s.i.g., such as model number CDB 0412FJD,  
 manufactured by Custom Stainless Equipment Company,  
 15 Santa Rose, California. The fiber used was Better  
 Basic™ 780 White Oak fiber, available from D.D.  
 Williamson & Company, Louisville, Kentucky.

	<u>Control</u> <u>(grams)</u>	<u>Example</u> <u>(grams)</u>
20 <u>Mix</u>		
Sugars	233	228
Flour	193	189
Shortening	55	54
25 Additional Ingredients	48	47
Oat fibers	-	5.3
Egg Albumen (dried)	-	5.3
<u>Add</u>		
30 Egg (whole)	156	156
Oil	67	67
Water	224	224
<u>Resulting Volume</u>	90 index units	93 index units
35 <u>Contour</u>	excellent	excellent
<u>Fragility</u>	excellent	excellent
<u>Organoleptic Quality</u>	excellent	excellent

Example 6White Cake Formula

- 5 This example shows that a cake product of the invention can be prepared with similar properties to a cake product prepared from a chlorinated flour. A cake product formulated with unchlorinated flour (Example) was prepared and compared to a cake product formulated and prepared with a chlorinated flour product (control).  
 10 The soft flour in the example was heated at 245°F for 60 minutes.

	<u>Control</u> <u>(grams)</u>	<u>Example</u> <u>(grams)</u>
15 <u>Mix</u>		
Sugars	224	232
Flour	217	225
Shortening	48	49
20 Additional Ingredients	41	42
Oat fibers	-	5.3
Egg Albumen (dried)	-	1.3
<u>Add</u>		
25 Egg (whites)	99	99
Oil	51	51
Water	290	290
<u>Resulting Volume</u>	85 index units	87 index units
30 <u>Contour</u>	excellent	excellent
<u>Fragility</u>	excellent	excellent
<u>Organoleptic Quality</u>	excellent	excellent

Example 7Chocolate Cake Formula

- 5 This example shows that a cake product of the invention can be prepared with similar properties to a cake product prepared from a chlorinated flour. A cake product formulated with unchlorinated flour (Example) was prepared and compared to a cake product formulated and prepared with a chlorinated flour product (control).  
 10 The soft flour in the example was heated at 245°F for 60 minutes.

		<u>Control</u> <u>(grams)</u>	<u>Example</u> <u>(grams)</u>
15	<u>Mix</u>		
	Sugars	200	197
	Flour	161	158
	Shortening	42	41
20	Additional Ingredients	119	117
	Oat fibers	-	5.2
	Egg Albumen (dried)	-	3.4
	<u>Add</u>		
25	Egg (whites)	156	156
	Oil	101	101
	Water	290	290
	<u>Resulting Volume</u>	92 index units	92 index units
30	<u>Contour</u>	excellent	excellent
	<u>Fragility</u>	excellent	excellent
	<u>Organoleptic Quality</u>	excellent	excellent

Example 8Yellow Cake Formula

5 This example shows that there can be variation in the oil and water content of the compositions of the invention, Examples 8A and 8B, without losing the desired properties. A cake product formulated with a heat treated flour treated at about 245°F for about  
 10 60 minutes was prepared and compared to a cake product formulated and prepared with a chlorinated flour product (control).

EXAMPLES

15		<u>Control</u>	<u>8A</u>	<u>8B</u>
	<u>Mix</u>	<u>(grams)</u>	<u>(grams)</u>	<u>(grams)</u>
	Sugar	233	228	228
20	Flour	193	189	189
	Shortening	55	54	54
	Additional	48	47	47
	Ingredients			
	Oat Fiber	-	5.3	5.3
25	Egg Albumin (dried)	-	5.3	5.3
	<u>Add</u>			
	Egg (whole)	156	156	156
	Oil	67	67	80
30	Water	224	224	246
	<u>Resulting Volume</u>	90	90	87
	<u>Eating Quality</u>	Moist	Moist	Extremely moist
	<u>Contour</u>	excellent	excellent	excellent
35	<u>Fragility</u>	excellent	excellent	excellent
	<u>Organoleptic</u>			
	<u>Quality</u>	excellent	excellent	excellent

While the invention has been specifically  
 40 described by reference to various embodiments, it will be recognized that various modifications, adaptations and variations, may be made without departing from the spirit and scope of the invention as defined by the following claims.

## WE CLAIM:

1. A high ratio baking composition comprising:
  - (a) a chlorine free heat treated soft flour;
  - (b) an effective volume controlling amount of a non-flour fiber;
  - (c) an effective fragility controlling amount of a protein; and
  - (d) sugar

wherein the density of a baked product resulting from the high ratio baking composition is less than about 5.6 to 6.3 g/in<sup>3</sup> and the weight ratio of the sugar to the heat treated soft flour is at least about 1:1.

2. The composition of claim 1 wherein said heat treated soft flour is prepared by heating a soft flour to a temperature greater than about 180°F for a sufficient amount of time to reduce the moisture content in the soft flour to below about 10%.

3. The high ratio baking composition according to claim 2 wherein the soft flour is effectively tempered following the heating to increase the moisture in the soft flour to above about 10.5%.

4. The high ratio baking composition according to claim 1 wherein the soft flour comprises a soft wheat flour.

5. The high ratio baking composition according to claim 1 wherein the amount of non-flour fiber is about 0.25 to 3% by weight of the soft flour.

6. The high ratio baking composition according to claim 1 wherein the non-flour fiber comprises an oat fiber.



7. The high ratio baking composition according to claim 1 wherein the protein comprises a water soluble, heat denaturable protein.

8. The high ratio baking composition according to claim 7 wherein the amount of the water soluble, heat denaturable protein is about 0.25 to 6% by weight of the soft flour and the water soluble, heat denaturable protein is selected from the group consisting of egg albumen, whey and mixtures thereof.

9. A high ratio cake composition comprising:

(a) a chlorine free heat treated soft flour prepared by heating a soft flour to a temperature greater than about 220°F for a sufficient amount of time to reduce the moisture level in the soft flour to below about 8%;

(b) about 0.25 to 3% by weight of a non-flour fiber;

(c) about 0.75 to 3% by weight of a water soluble, heat denaturable protein; and

(d) a sugar

wherein the weight ratio of the sugar to the heat treated soft flour is at least about 1.15 to 1.

10. The high ratio cake composition of claim 9 comprising:

(a) a chlorine free heat treated soft flour prepared by heating a soft flour to a temperature of about 240 to 250°F for a sufficient amount of time to reduce the moisture level in the soft flour to about 5.5 to 7%;

(b) about 0.75 to 1.25% of a non-flour fiber by weight of the soft flour;

(c) about 0.75 to 1.5% of a water soluble, heat denaturable protein by weight of the soft flour; and

(d) a sugar

wherein the weight ratio of the sugar to the heat treated soft flour is at least about 1.3 to 1.

11. The high ratio cake composition according to claim 9 wherein the soft flour is effectively tempered following the heating to increase the moisture in the soft flour to above about 10.5%.

12. The high ratio cake composition according to claim 9 wherein the non-flour fiber comprises an oat fiber.

13. The high ratio cake composition according to claim 9 wherein the water soluble, heat denaturable protein is selected from the group consisting of egg albumen, whey protein, soy protein and mixtures thereof.

14. A baked product resulting from the high ratio baking composition of claim 1.

15. A cake product resulting from the high ratio composition of claim 9.

16. A method of preparing a high ratio baking composition comprising the steps of:

(a) preparing a chlorine free heat treated soft flour; and

(b) combining the heat treated soft flour with an effective volume controlling amount of a non-flour fiber and an effective fragility controlling amount of a protein.

17. The method of claim 16 wherein the heat treated soft flour is prepared by heating a soft flour to a temperature greater than 180°F for a sufficient amount of time to reduce the moisture content in the flour to below about 10%.

18. The method of claim 16 further comprising the steps of tempering the soft flour following the heating to increase the moisture in the soft flour to above about 10.5% by weight.

19. A method of preparing a high ratio cake composition comprising the steps of:

(a) preparing a chlorine free heat treated soft flour by heating a soft flour to a temperature greater than about 220°F for a sufficient amount of time to reduce the moisture level in the soft flour to below about 8%; and

(b) combining:

(i) the heat treated soft flour:

(ii) about 0.75 to 3% by weight of a water soluble, heat denaturable, non-flour protein;

(iii) about 0.25 to 3% by weight of a non-flour fiber; and

(iv) a sugar

wherein the weight ratio of the sugar to the heat treated soft flour is at least about 1.15 to 1.

20. The method of claim 19 further comprising the steps of tempering the soft flour following the heating to increase the moisture in the soft flour to above about 10.5% by weight.

21. The method of preparing a high ratio cake composition according to claim 19 wherein the chlorine free heat treated soft flour is prepared by heating a soft flour to a temperature of about 240 to 250°F for a sufficient amount of time to reduce the moisture level in the soft flour to about 5.5 to 7%, and the composition comprises: the heat treated soft flour; about 0.75 to 1.25% of a non-flour fiber by weight of the soft flour; about 0.75 to 1.5% of a water soluble, heat denaturable protein by weight of the soft flour;

and a sugar wherein the weight ratio of the sugar to the heat treated soft flour is at least about 1.3 to 1.

22. A cake product comprising a high ratio baking composition prepared according to the method of claim 16.

23. A cake product prepared according to the method of claim 19.

## INTERNATIONAL SEARCH REPORT

Int. Application No  
PCT/US 94/08768A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 A21D6/00 A21D13/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A21D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US,A,3 428 461 (W. A. HATTON ET AL.) 18 February 1969  see claim 1; examples ---	1,2, 7-10, 13-17, 19-23
Y	GB,A,1 499 986 (J. LYONS AND COMPANY LTD) 1 February 1978  see page 4, line 111 - line 116; claims; examples ---	1-4, 7-11, 13-23
Y	US,A,2 525 599 (E. G. GUSTAVSON) 10 October 1950 see column 2, line 47 - column 3, line 18; claims --- -/--	1-23

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

21 November 1994

Date of mailing of the international search report

14. 12. 94

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# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US 94/08768

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	WO,A,91 19421 (KRAFT GENERAL FOODS INC.) 26 December 1991 see claims 2,11 ---	1-23
Y	EP,A,0 552 006 (CONAGRA INC.) 21 July 1993 see claims 1,9-13; examples 22-24; table 11B ---	1-23
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Information on patent family members

Int. lional Application No

PCT/US 94/08768

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